Soils

Total and aqua regia leachable element content

	Certified values			
	ERM-CC141 - Loam soil 24 g			
Total element content	As	9.9 ± 1.5	mg/kg
	Cd	0.35 ± 0.05	mg/kg
	Co	8.5 ± 0.5	mg/kg
	Cr	86 ± 8	mg/kg
	Cu	14.4 ± 1.34	mg/kg
	Hg	0.083 ± 0.017	mg/kg
	Mn	464 ± 18	mg/kg
	Ni	26.4 ± 2.4	mg/kg
	Pb	41 ± 4	mg/kg
	Zn	57 ± 4	mg/kg
Aqua regia leachable	As	7.5 ± 1.4	mg/kg
	Cd	0.25 ± 0.04	mg/kg
	Co	7.9 ± 0.9	mg/kg
	Cr	31 ± 4	mg/kg
	Cu	12.4 ± 0.9	mg/kg
	Hg	0.080 ± 0.008	mg/kg
	Mn	387 ± 17	mg/kg
	Ni	21.9 ± 1.6	mg/kg
	Pb	32.2 ± 1.4	mg/kg
	Zn	50 ± 4	mg/kg
	BCR-142R - light sandy soil 50 g		
Total element content	Cd	0.34 ± 0.04	mg/kg
	Co	12.1 ± 0.7	mg/kg
	Cu	69.7 ± 1.3	mg/kg
	Hg	0.067 ± 0.011	mg/kg
	Mn	970 ± 16	mg/kg
	Ni	64.5 ± 2.5	mg/kg
	Pb	40.2 ± 1.9	mg/kg
Aqua regia leachable	Cd	0.249 ± 0.010	mg/kg
	Pb	25.7 ± 1.6	mg/kg
	Zn	93.3 ± 2.7	mg/kg
	BCR-143R - Sewage sludge amended soil 50 g		
Total element content	Cd	71.8 ± 1.2	mg/kg
	Co	12.3 ± 0.3	mg/kg
	Cu	130.6 ± 1 .5	mg/kg
	Hg	1.10 ± 0.07	mg/kg
	Mn	904 ± 13	mg/kg
	Ni	299 ± 5	mg/kg
	Pb	179.7 ± 2.1	mg/kg
	Zn	1055 ± 14	mg/kg
Aqua regia leachable	Cd	72.0 ± 1.8	mg/kg
	Cr	426 ± 12	mg/kg
	Mn	858 ± 11	mg/kg
	Ni	296 ± 4	mg/kg
	Pb	174 ± 5	mg/kg
	Zn	1063 ± 16	mg/kg

Pedological parameters

IRMM-443-1 to IRMM-443-7 are representative for major European soil types. They are available in units of 200 g and are certified for the following pedological parameters:

- K_f of atrazine according OECD Testguideline 106
- 1/n of atrazine according OECD Testguideline 106
- K_f of 2,4-D according OECD Testguideline 106
- 1/n of 2,4-D according OECD Testguideline 106
- K_f of lindane according OECD Testguideline 106
- 1/n of lindane according OECD Testguideline 106
- pH in water according to ISO 10390
- pH in 0.01M $CaCl_2$ according to ISO 10390

Rare earth elements

	Certified values			
ERM-CC690 calcareous soil 70 g	Ce	49.1 ± 2.5	mg/kg
	Dy	2.90 ± 0.28	mg/kg
	Gd	3.2 ± 0.4	mg/kg
	La	24.4 ± 1.7	mg/kg
	Nd	19.1 ± 2.2	mg/kg
	Sc	7.9 ± 0.9	mg/kg
	Sm	3.5 ± 0.4	mg/kg
	Tb	0.50 ± 0.07	mg/kg
	Th	7.6 ± 0.8	mg/kg
	Tm	0.232 ± 0.026	mg/kg
	U	1.90 ± 0.23	mg/kg
	Yb	1.57 ± 0.19	mg/kg

How to order reference materials

From JRC-IRMM

Tel.: +32 14 571 705 • Fax: +32 14 590 406
https://ec.europa.eu/jrc/en/reference-materials
E-mail: jrc-irmm-rm-distribution@ec.europa.eu

From authorised distributors

LGC Standards GmbH (DE)
http://www.lgcstandards.com/
E-mail: de@lgcstandards.com

Sigma-Aldrich Chemie GmbH (CH)
http://www.sigmaaldrich.com/irmm
E-mail: flukatec@sial.com

Sigma-Aldrich RTC Inc. (USA)
http://www.RT-Corp.com
E-mail: RTCSalesgroup@sial.com

ARMI (USA)
http://www.armi.com
E-mail: Info@ARMI.com

Industrial Analytical (RSA)
http://www.industrialanalytical.co.za
E-mail: info@industrialanalytical.co.za

BELAC **Accredited CRM Producer**: the JRC-IRMM is accredited to ISO Guide 34:2009 for the production of reference materials under the code BELAC 268-RM

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Certified reference materials for sewage sludges, sediments and soils

Sewage sludges

Total and aqua regia leachable element content

	Certified values			
BCR-146R sewage sludge (industrial origin) 50 g	**Total element content**			
	Cd	18.8 ± 0.5	mg/kg
	Co	7.39 ± 0.27	mg/kg
	Cr	196 ± 7	mg/kg
	Cu	838 ± 16	mg/kg
	Hg	8.6 ± 0.4	mg/kg
	Mn	323 ± 7	mg/kg
	Ni	70 ± 5	mg/kg
	Pb	609 ± 14	mg/kg
	Zn	3060 ± 60	mg/kg
	Aqua regia leachable		
	Cd	18.4 ± 0.4	mg/kg
	Co	6.5 ± 0.4	mg/kg
	Cr	174 ± 7	mg/kg
	Cu	831 ± 16	mg/kg
	Hg	8.39 ± 0.25	mg/kg
	Mn	298 ± 9	mg/kg
	Ni	65.0 ± 3.0	mg/kg
	Pb	583 ± 17	mg/kg
	Zn	3040 ± 60	mg/kg

Total and aqua regia leachable element content

	Certified values			
BCR-145R sewage sludge (mixed origin) 40 g	**Total element content**			
	Cd	3.50 ± 0.15	mg/kg
	Co	5.6 ± 0.4	mg/kg
	Cu	696 ± 12	mg/kg
	Hg	2.01 ± 0.22	mg/kg
	Mn	156 ± 4	mg/kg
	Ni	247 ± 7	mg/kg
	Pb	286 ± 5	mg/kg
	Zn	2122 ± 23	mg/kg
	Aqua regia leachable		
	Cd	(3.43 ± 0.17)	mg/kg
	Co	(5.3 ± 0.7)	mg/kg
	Cr	307 ± 13	mg/kg
	Cu	707 ± 9	mg/kg
	Hg	(1.99 ± 0.08)	mg/kg
	Mn	(145 ± 7)	mg/kg
	Ni	251 ± 6	mg/kg
	Pb	282 ± 9	mg/kg
	Zn	2140 ± 50	mg/kg

Values in brackets are indicative only

Dioxins and furans

	Certified values			
BCR-677 sewage sludge 40 g	**Dioxins**		
	D48	1.51 ± 0.16	ng/kg
	D54	4.1 ± 0.9	ng/kg
	D67	235 ± 16	ng/kg
	D70	79 ± 7	ng/kg
	D73	3500 ± 400	ng/kg
	D75	12700 ± 800	ng/kg
	Furans		
	F83	45 ± 4	ng/kg
	F94	24.8 ± 1.6	ng/kg
	F114	16.9 ± 1.5	ng/kg
	F118	14.5 ± 1.6	ng/kg
	F121	6.1 ± 0.8	ng/kg
	F124	0.84 ± 0.29	ng/kg
	F130	5.6 ± 0.6	ng/kg
	F131	62 ± 3	ng/kg
	F134	6.3 ± 0.8	ng/kg
	F135	177 ± 7	ng/kg

Confidence in measurements

All certificates and detailed production information can be found at https://crm.irmm.jrc.ec.europa.eu

https://ec.europa.eu/jrc/

ERM European Reference Materials

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Sediments

Extractable element fractions

		Extraction media for which values are assigned
BCR-483 sewage sludge amended soil 35 g	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-484 sewage sludge amended (terra rossa) soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-700 organic-rich soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid

Metal species content

	Certified values				
ERM-CC580 estuarine sediment 40 g	Total Hg CH_3Hg	132 0.075	± 3 ± 0.004		mg/kg mg/kg
BCR-462 coastal sediment 25 g	Tributyltin Dibutyltin	54 68	± 15 ± 12		µg/kg µg/kg
BCR-646 freshwater sediment 40 g	Tributyltin Dibutyltin Monobuytltin Triphenyl-tin Diphenyltin Monophenyl-tin	480 770 610 29 36 69	± 80 ± 90 ± 120 ± 11 ± 8 ± 18		µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg

Extractable element fractions

	Certified values				
BCR-684 river sediment, 35 g	NaOH-extractable P HCl-extractable P Inorganic P Organic P Conc. HCl-extract. P	550 536 1113 209 1373	± 21 ± 28 ± 24 ± 9 ± 35		mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-701 lake sediment, 20 g	Cd Cr Cu Ni Pb Zn	Values according to the 3-step sequential extraction procedure; in addition, indicative values for total element contents are assigned			

Organic pollutants

	Certified values				
BCR-524 industrial soil 40 g	Pyrene benz[a]anthracene benzo[a]pyrene benzo[e]pyrene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo [b] naphtho [2,1-d]-thiophene Indeno [1,2,3-cd] pyrene Pentachlorophenol	173 22.5 8.6 10.6 13.5 6.2 3.8 5.1 0.034	± 11 ± 1.8 ± 0.5 ± 1.4 ± 1.6 ± 0.6 ± 0.6 ± 0.4 ± 0.005		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-481 industrial soil 25 g	PCB-101 PCB-118 PCB-128 PCB-149 PCB-153 PCB-156 PCB-170 PCB-180	37 9.4 9.1 97 137 7.0 52 124	± 3 ± 0.7 ± 0.8 ± 7 ± 7 ± 0.5 ± 4 ± 6		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-529 industrial (sandy) soil 50 g	3,4-dichlorophenol 2,4,5-trichlorophenol Pentachlorophenol D48 D54 D66 D67 D70 F83 F94 F114 F118 F121 F124 F130	0.23 1.51 0.23 4.5 0.44 1.22 5.4 3.0 0.078 0.145 0.36 3.4 1.09 0.022 0.37	± 0.04 ± 0.10 ± 0.04 ± 0.6 ± 0.05 ± 0.21 ± 0.9 ± 0.4 ± 0.013 ± 0.028 ± 0.07 ± 0.5 ± 0.15 ± 0.010 ± 0.05		mg/kg mg/kg mg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg
BCR-530 industrial (clay) soil 50 g	3,4-dichlorophenol 2,4,5-trichlorophenol Pentachlorophenol Dioxins and furans: D67 D70 F94 F114 F118 F121 F130	6.0 40 0.47 0.061 0.0218 0.24 0.62 0.321 0.186 0.126	± 0.5 ± 7 ± 0.09 ± 0.011 ± 0.0029 ± 0.04 ± 0.07 ± 0.016 ± 0.023 ± 0.012		mg/kg mg/kg mg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg

Total and aqua regia leachable element content

	Certified values				
BCR-277R estuarine sediment 40 g	As Cd Co Cr Cu Hg Ni Se Sn Zn	18.3 0.61 22.5 188 63 0.128 130 (0.58 (6.5 178	± 1.8 ± 0.07 ± 1.4 ± 14 ± 7 ± 0.017 ± 8 ± 0.11) ± 1.8) ± 20		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-280R lake sediment 40 g	As Cd Co Cr Cu Fe Hg Mn Ni Sc	33.4 0.85 16.8 126 53 1.46 69 (0.46 (9.5 224	± 2.9 ± 0.10 ± 0.9 ± 7 ± 6 ± 0.20 ± 5 ± 0.09) ± 1.7) ± 25		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-320R channel sediment 30 g	As Cd Co Cr Cu Fe Hg Mn Ni Pb Sc Se Sn Th Tl U V Zn	21.7 2.64 9.7 59 46.3 25700 0.85 910 27.1 85 5.2 (0.96 (9.4 5.3 0.65 1.56 46.5 318	± 2.0 ± 0.18 ± 0.6 ± 4 ± 2.9 ± 1300 ± 0.09 ± 50 ± 2.2 ± 5 ± 0.4 ± 0.18) ± 1.7) ± 0.4 ± 0.08 ± 0.20 ± 2.8 ± 20		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-667 estuarine sediment, 40 g	Ce Dy Er Eu Gd Ho La Lu Nd Pr Sc Sm Tb Th Tm U Yb	56.7 4.01 2.35 1.00 4.41 0.80 27.8 0.325 25.0 6.1 13.7 4.66 0.682 10.0 0.326 2.26 2.20	± 2.5 ± 0.14 ± 0.15 ± 0.05 ± 0.12 ± 0.06 ± 1.0 ± 0.020 ± 1.4 ± 0.5 ± 0.7 ± 0.20 ± 0.017 ± 0.5 ± 0.025 ± 0.15 ± 0.09		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg

Values in brackets are indicative only.

Organic pollutants

	Certified values				
BCR-535 freshwater harbour sediment 40 g	Pyrene Benz[a]anthracene Benzo[a]pyrene Benzo[e]pyrene Benzo[b]fluoranthene Benzo[k]fluoranthene Indeno [1,2,3-cd] pyrene	2.52 1.54 1.16 1.86 2.29 1.09 1.56	± 0.18 ± 0.10 ± 0.10 ± 0.13 ± 0.15 ± 0.15 ± 0.14		mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
BCR-536 freshwater harbour sediment 40 g	PCB-28 PCB-52 PCB-101 PCB-105 PCB-118 PCB-128 PCB-138 PCB-149 PCB-153 PCB-156 PCB-163 PCB-170 PCB-180	44 38 44 3.5 28 5.4 27 49 50 3.0 17 13.4 22	± 5 ± 4 ± 4 ± 0.6 ± 3 ± 1.2 ± 4 ± 4 ± 4 ± 0.4 ± 3 ± 1.4 ± 2		µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg µg/kg